

## INTERNATIONAL SEARCH REPORT

International application No.  
**PCT/AU2004/001135**

### Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

### Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:  
See attached sheet:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

#### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.  
☐ No protest accompanied the payment of additional search fees.

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 09 AUG 2005

WIPO

PCT

Applicant's or agent's file reference 5399AUS	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. CT/AU2004/001135	International filing date (day/month/year) 25 August 2004	Priority date (day/month/year) 25 August 2003
International Patent Classification (IPC) or national classification and IPC Int. Cl. <sup>7</sup> B07C 5/36, 5/10		
Applicant AUSTRALIAN INSPECTION TECHNOLOGIES et al		

- This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
- a. ☒ (sent to the applicant and to the International Bureau) a total of 4 sheets, as follows:
- ☒ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
- ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
- b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:
- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Box No. I   | Basis of the report   |
| <input type="checkbox"/> Box No. II             | Priority  |
| <input type="checkbox"/> Box No. III            | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/> Box No. IV             | Lack of unity of invention  |
| <input checked="" type="checkbox"/> Box No. V   | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> Box No. VI             | Certain documents cited   |
| <input checked="" type="checkbox"/> Box No. VII | Certain defects in the international application  |
| <input type="checkbox"/> Box No. VIII           | Certain observations on the international application   |

Date of submission of the demand 17 February 2005	Date of completion of the report 28 July 2005
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer  JOHN DEUIS Telephone No. (02) 6283 2146

# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/AU2004/001135

## Box No. I Basis of the report

With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1 (b))

☐ publication of the international application (under Rule 12.4)

☐ international preliminary examination (under Rules 55.2 and/or 55.3)

With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages 1-12 as originally filed/furnished

pages\* received by this Authority on with the letter of

pages\* received by this Authority on with the letter of

☒ the claims:

pages as originally filed/furnished

pages\* 18-21 as amended (together with any statement) under Article 19

pages\* received by this Authority on with the letter of

pages\* received by this Authority on with the letter of

☒ the drawings:

pages 1/8-8/8 as originally filed/furnished

pages\* received by this Authority on with the letter of

pages\* received by this Authority on with the letter of

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/figs

☐ the sequence listing (*specify*):

☐ any table(s) related to the sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/figs

☐ the sequence listing (*specify*):

☐ any table(s) related to the sequence listing (*specify*):

\* If item 4 applies, some or all of those sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**

International application No.

**PCT/AU2004/001135**

**Box No. V** Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

**Statement**

Novelty (N)	Claims 1-22	YES
	Claims	NO
Inventive step (IS)	Claims 1-22	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-22	YES
	Claims	NO

**Citations and explanations (Rule 70.7)**

None of the individual documents disclose all the essential features as claimed. Claims 1-22 are novel and involve and inventive step.

The invention is directed to a sorting method comprising feeding particles axially under gravity onto a body to form a monolayer, wherein the particles experience no horizontal vibratory forces.

The closest art found was:

US 4858771 A (HAWKINS et al.) 22 August 1989

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**

International application No.

**PCT/AU2004/001135**

**Box No. VII Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

The numbering of the amended claims is not consistent with the numbering of original pages filed.

**AMENDED CLAIMS**

[received by the International Bureau on 14 December 2004 (14.12.04);  
original claims 1-24 replaced by new claims 1-22 (4 pages).]

**1. A sorting method including the steps of:**

**forming an at least part annular, substantially monolayer flow of particulate material by axially flowing said particulate material over a body member having a substantially conical flow surface bounded by a substantially horizontal peripheral edge and whereby said flow is directed substantially vertically from said edge under gravity;**

**operating a detector having an optical element located substantially centred within said annular flow downstream of said body member whereby the path length from all parts of the flow to said detector is substantially constant, said detector being selected to apply a sorting criterion on the particles in said flow; and**

**operating sorting means responsive to said detector to sort particles in said flow according to said criterion.**

**2. Sorting apparatus including:**

**a body member having a substantially conical surface bounded by a substantially horizontal peripheral edge;**

**a supply of a particulate material to said flow surface, said supply being selected whereby said particulate material axially passes said peripheral edge and is directed substantially vertically from said edge under gravity forming an at least part annular, substantially monolayer flow;**

**a detector having an optical element located substantially centred within said annular flow downstream of said body member whereby the path length from all parts of the flow to said detector is substantially constant, said detector being selected to apply a sorting criterion on the particles in said flow; and**

**sorting means responsive to said detector to sort particles in said flow according to said criterion.**

**3. Sorting apparatus according to Claim 2, wherein said particles are formed into an annular flow.**

4.     Sorting apparatus according to Claim 2, wherein said particulate flow passes the edge of the body member to enter a detection area downstream of the body member and containing the optical element.
5.     Sorting apparatus according to Claim 4, wherein said particulate flow is irradiated by an actual or effectively rotating a source, and that the detector detects the intensity of the reflected or transmitted component of said radiation.
6.     Sorting apparatus according to Claim 5, wherein said source is a monochromatic point-source beam which scans the particulate flow in a direction normal to the particulate flow direction.
7.     Sorting apparatus according to Claim 6, wherein said reflected light is filtered to remove all other wavelengths than the required wavelength to render the detected signal monochromatic.
8.     Sorting apparatus according to Claim 7, wherein said filtering is performed using one or more band pass optical filters that transmit only the required wavelength bands.
9.     Sorting apparatus according to Claim 7, wherein said filtering is performed using one or more band reject optical filters that reflect only the required wavelength bands.
10.    Sorting apparatus according to claim 5, wherein said detected light is polychromatic.
11.    Sorting apparatus according to Claim 10, wherein said polychromatic light is resolved into a spectrum by a diffraction grating, and wherein said detector comprises a plurality of detection elements disposed to interpret said spectrum.

12. Sorting apparatus according to Claim 11, wherein said detection elements are selected from photo multipliers, CCD arrays or like photoelectric sensitive measuring devices.
13. Sorting apparatus according to any one of Claims 2 to 12, wherein said sorting means comprises one or more rejectors responsive to said detector and adapted to impinge upon a selected particle to displace said particle from said flow.
14. Sorting apparatus according to Claim 13, wherein said one or more rejectors each comprise means to generate an air blast which rejects a detected particle from the particulate flow in response to a signal generated in response to detection by said detector.
15. Sorting apparatus according to Claim 14, wherein said rejectors comprise an annular manifold containing a single row of air valves, each valve facing approximately 90° to the particulate flow, substantially parallel to the product flow and offset with a clearance gap therefrom.
16. Sorting apparatus according to Claim 14, wherein said rejectors comprise a plurality of annular manifolds each containing a single row of air valves, each valve facing approximately 90° to the particulate flow, substantially parallel to the product flow and offset with a clearance gap therefrom, and wherein said air valves are aligned between the rows in the direction of said flow, whereby aligned air valves are operated sequentially to impact a selected particle sequentially.
17. A sorting method comprising:  
forming an at least part annular flow of material;



detecting by a detector radiation from the material in the at least part annular flow, the radiation from substantially all parts of the flow having travelled substantially the same distance from the annular flow to the detector; and operating a sorting mechanism in response to the detected radiation to sort the material in the flow.

18. The method of claim 17, wherein the radiation is received by an optical element located substantially centrally with respect to the at least part annular flow, and wherein the optical element directs the radiation to the detector.

19. The sorting method according to claim 18 wherein the optical element comprises a rotatable mirror.

20. A sorting apparatus comprising:

means for forming an at least part annular flow of material;

a detector for detecting radiation from the material in the at least part annular flow after the radiation from substantially all parts of the flow has travelled substantially the same distance from the flow to the detector; and a sorting mechanism for sorting material in the flow in response to the radiation detected by the detector.

21. A sorting apparatus according to claim 20, wherein an optical element is arranged substantially centrally with respect to the annular flow when the annular flow is created for directing radiation from the material in the annular flow to the detector.

22. The sorting apparatus according to claim 21 wherein the optical element comprises a rotating mirror.